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(54) Abstract Title

Inflatable bunding system

(57) A bunding system (1) comprises an inflatable frame having two or more wall portions (2a-d), where at least one of the wall portions is independently inflatable and deflatable and the bunding system is capable of being rolled or folded when not in use. The system may further include a reinforced floor portion (4), a protective under blanket (6) and a trolley (Figures 5-7) for transporting the inflatable frame having a reel mounted on a movable base.

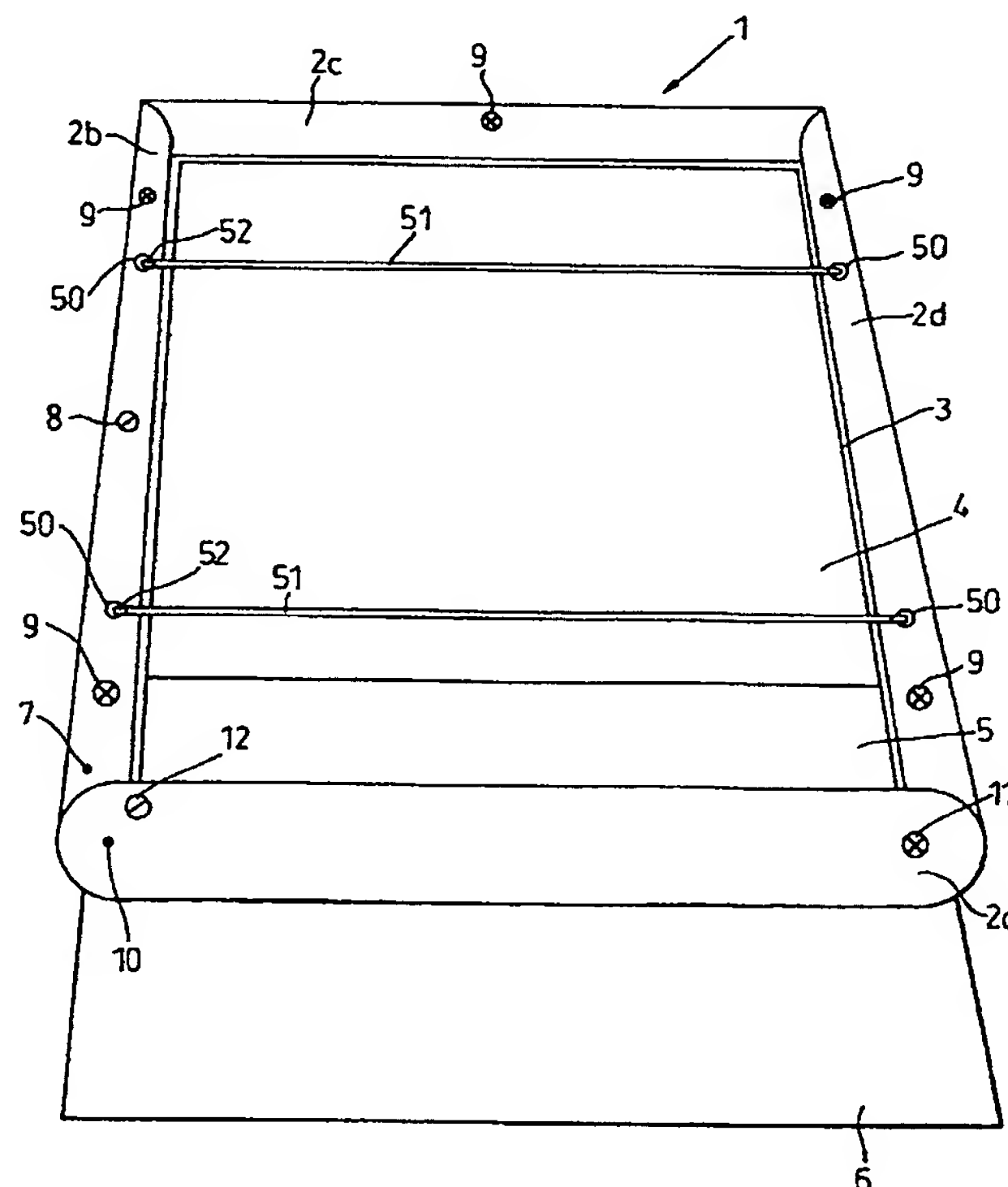


Fig. 1

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

The claims were filed later than the filing date but within the period prescribed by Rule 25(1) of the Patents Rules 1995.

GB 2 368 609 A

1/7

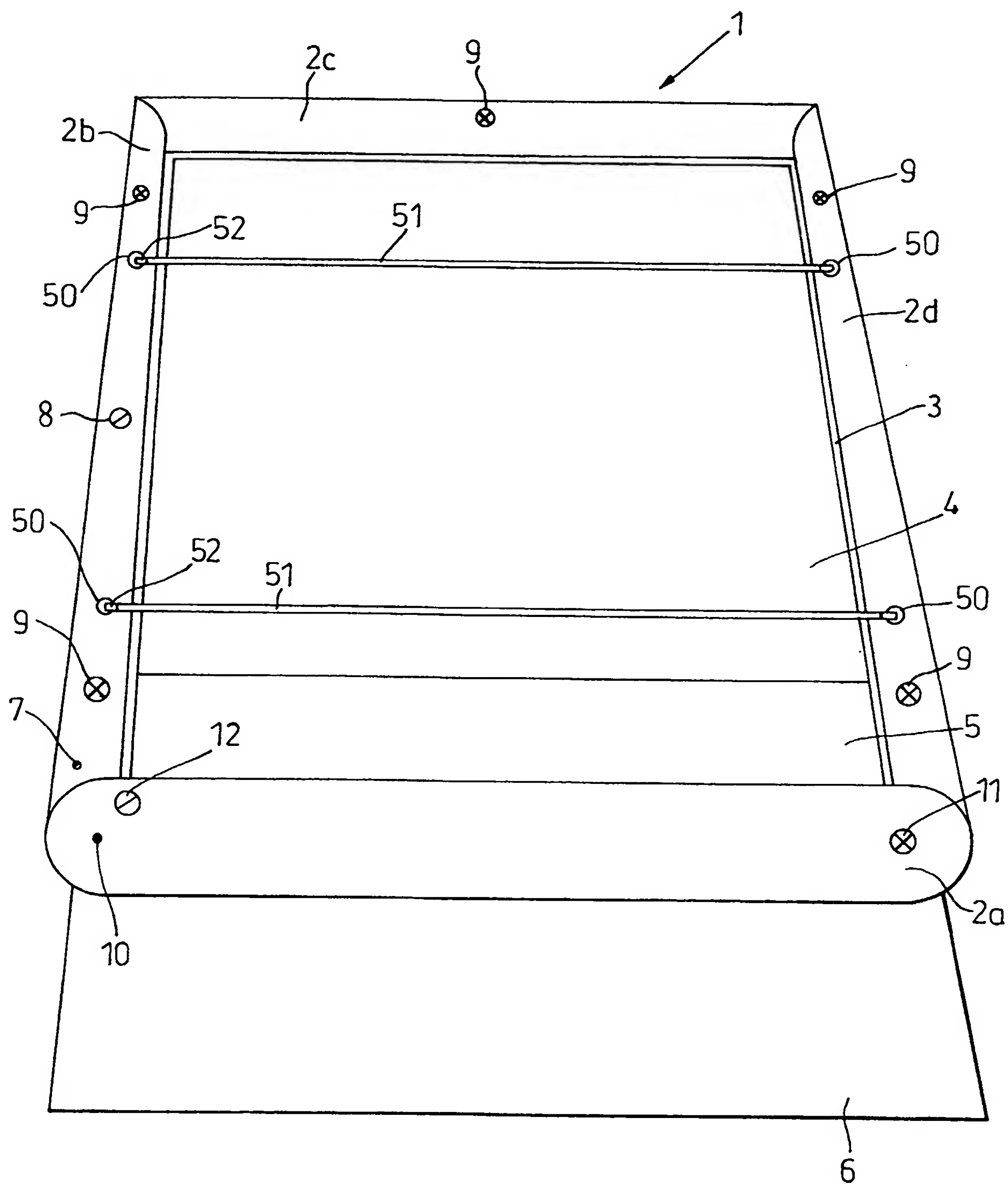


Fig. 1

2/7

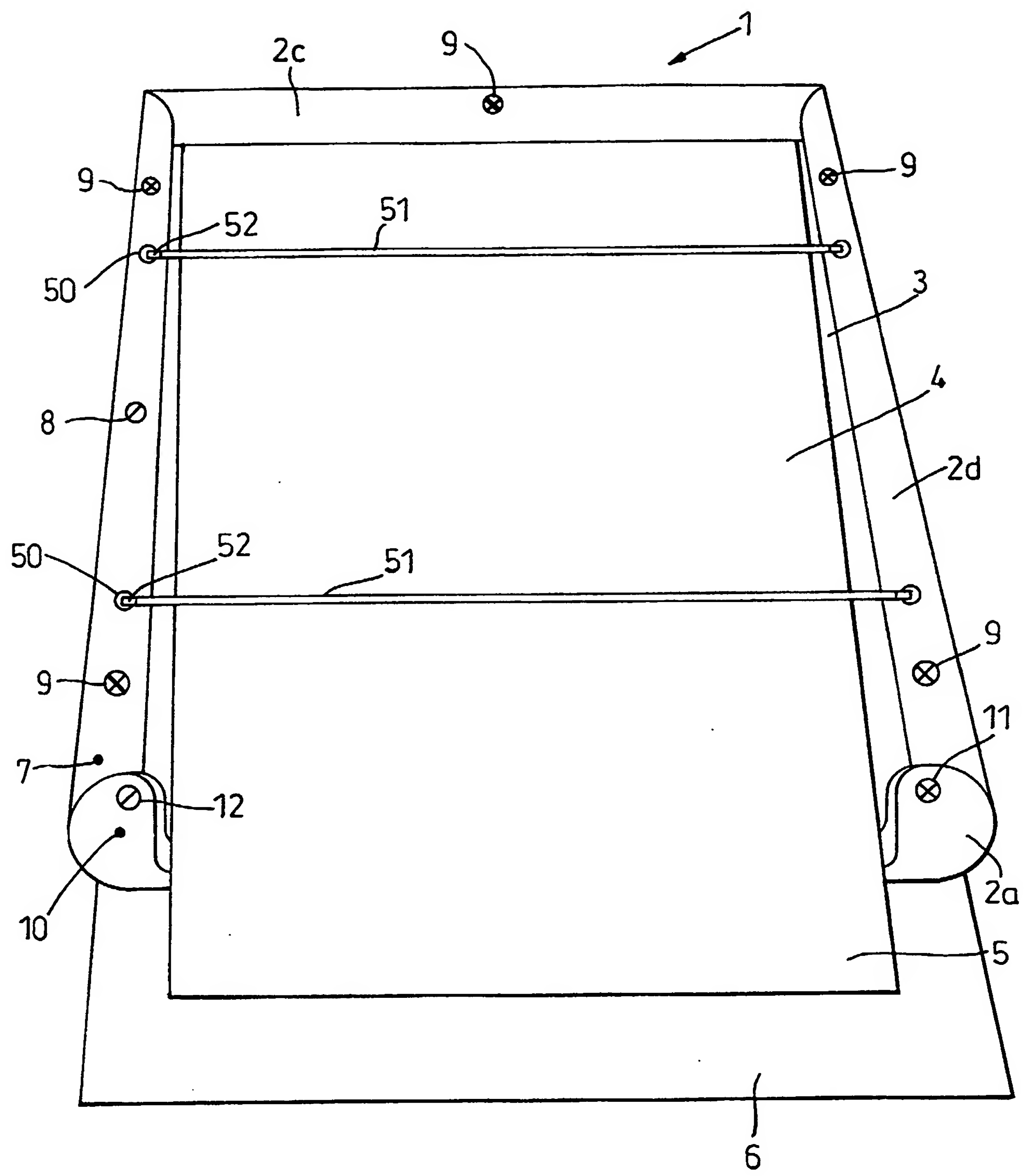


Fig. 2

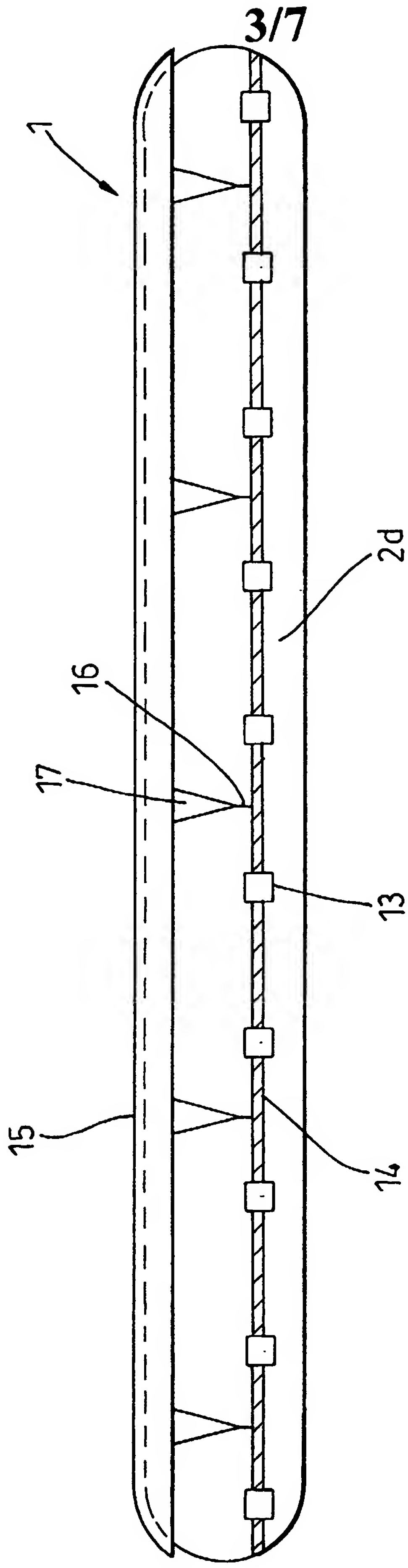


Fig. 3

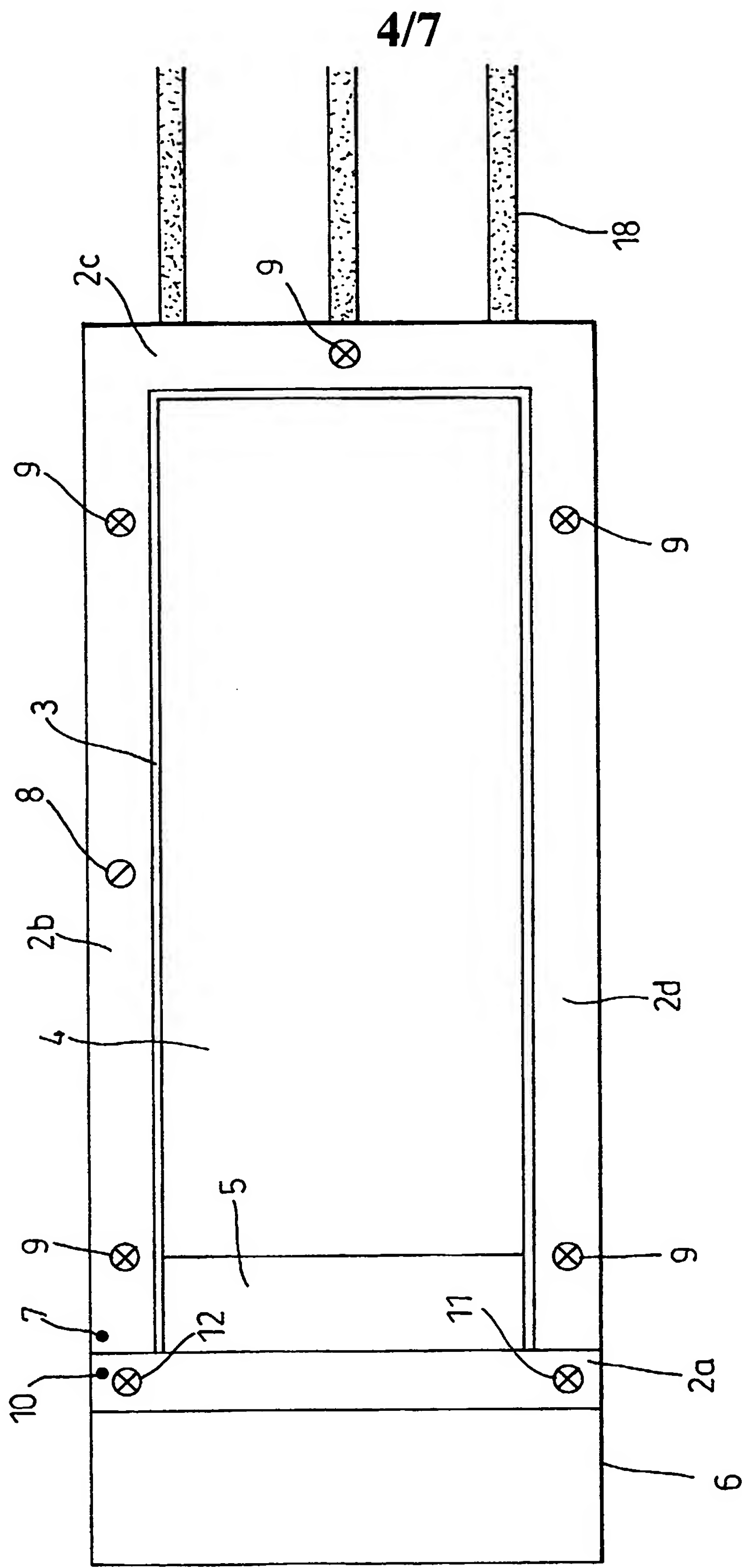


Fig. 4

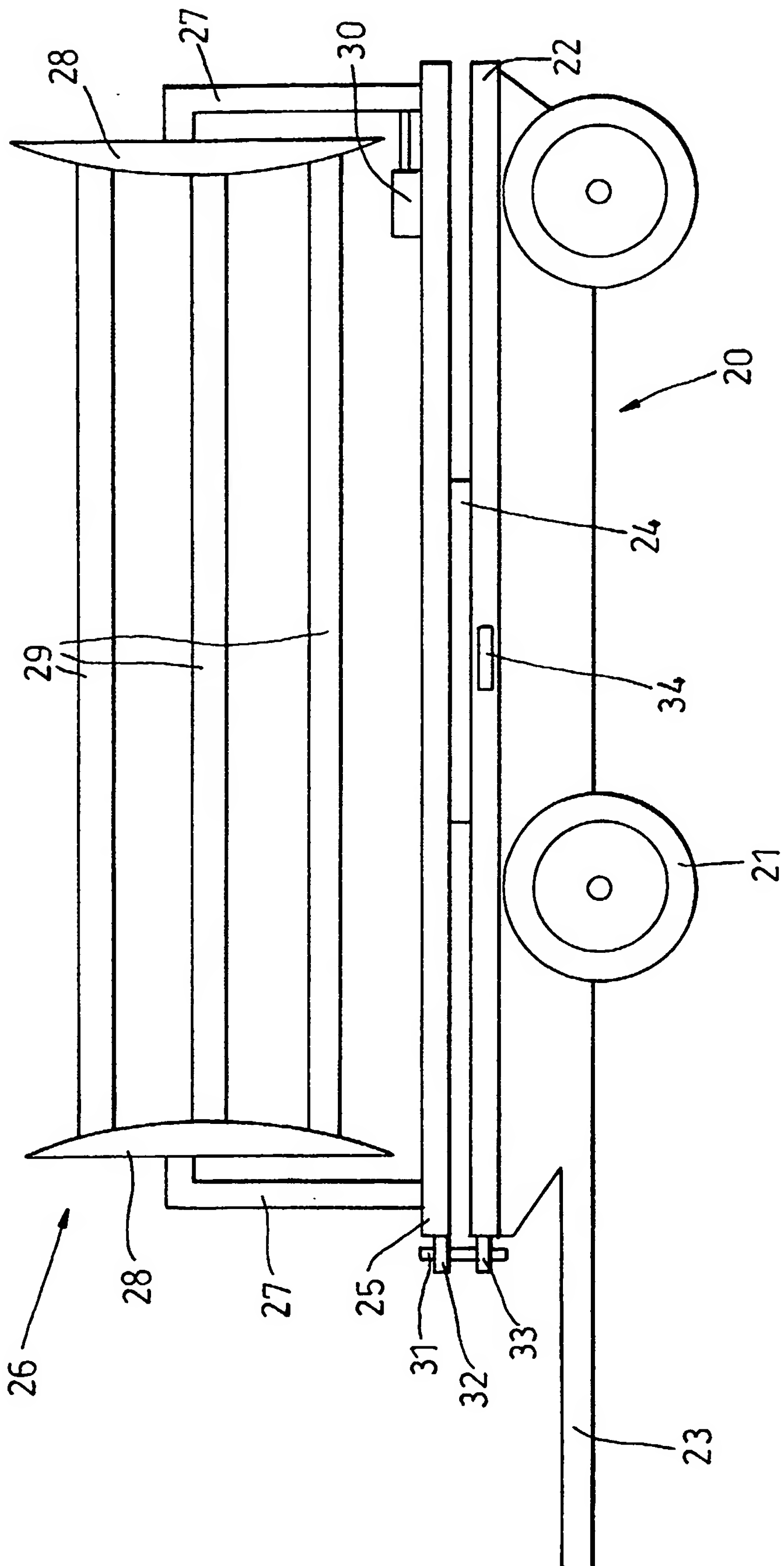


Fig. 5

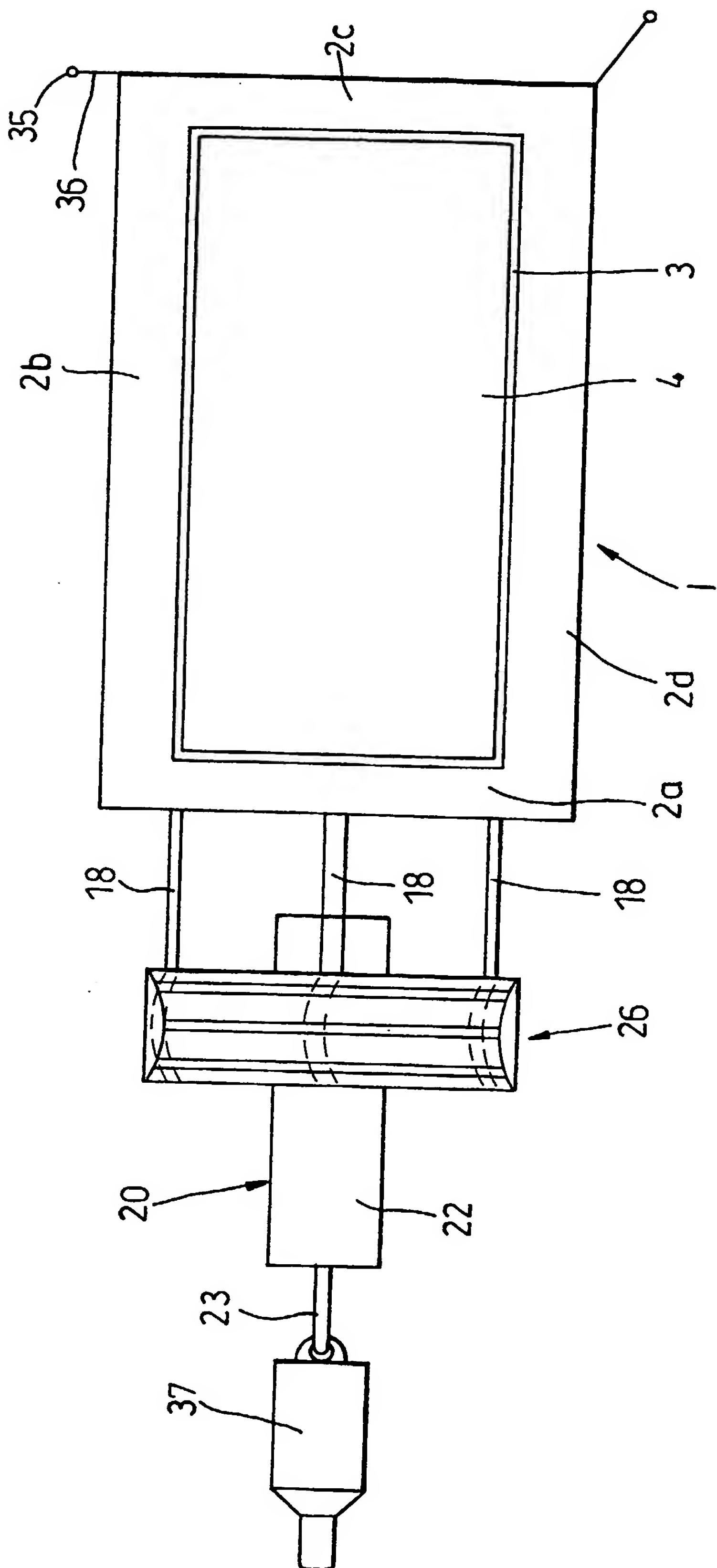


Fig. 6

FIG. 7

7/7

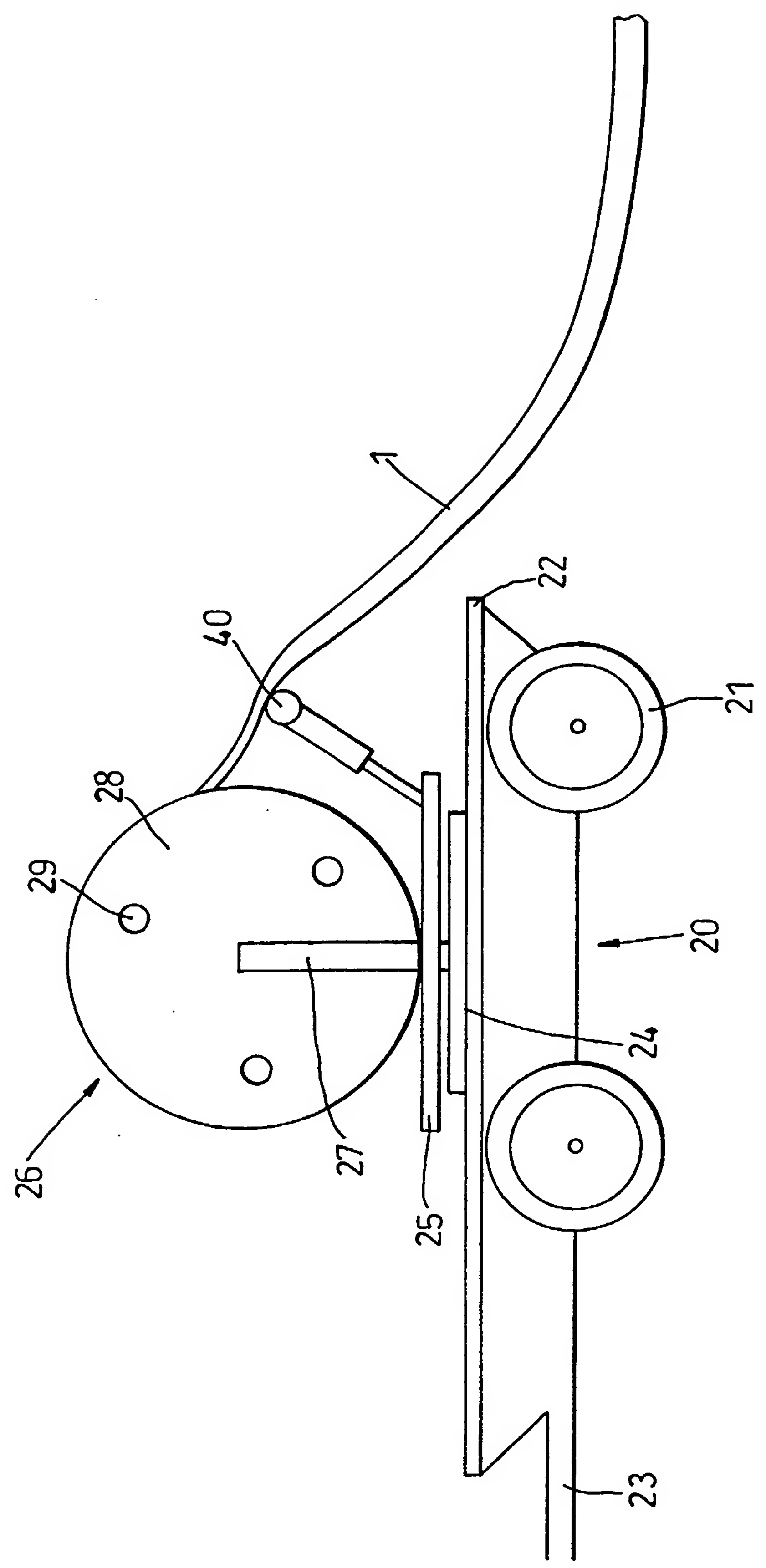


Fig. 7

**IMPROVEMENTS IN AND RELATING TO BUNDING FOR
STORAGE OF FLUID MATERIALS**

5 The present invention concerns improvements in and relating to bunding for storage of fluid materials, including fluid/ solid mixtures, and in particular, but not exclusively, fuel fluids or dangerous fluids.

10 Owing to forthcoming legislation there will soon be a need to house portable equipment containing fuel chemicals/ fluids or dangerous fluids in a bunded area that is capable of holding 110% of the fluid contained within the portable equipment. Therefore, in the event of a spillage or leak the bunding must be capable of containing the fluid to prevent damage to the surrounding area.

15 The term "bunding " in this context covers a fluid impervious barrier that forms a "bunded area".

20 Portable equipment which will require housing in a bunded area will include, for example, fuel driven generators and road tankers. The requirement that this portable equipment is housed in a bunded area causes a number of problems that need to be addressed. The equipment is portable and therefore the bunding must also be portable which leads to problems when it has to be large enough to house a road tanker. The bunding must also be relatively easy and quick to erect.

25 The aim of the present invention is therefore to provide a bunding that is readily portable, even if it is large in size, and is easy and quick to erect.

30 Accordingly the present invention provides a bunding system suitable for the storage of fluid materials comprising an inflatable frame comprising two or more wall portions wherein at least one of the two or more wall

portions is inflatable and deflatable separately from the remaining wall portions and the bunding system is capable of being rolled or folded up.

5 The bunding system of the present invention is easily transportable before and after use but is sturdy and practical in use. The system can be transported to and from the most inaccessible regions. The bunding systems can be provided in a variety of sizes but are always readily transportable as they can be rolled or folded up. The bunding system can be easily carried in the boot of a car, in a trailer or on a specially
10 designed trailer having a reel onto which the bunding system can be wound.

The provision of a separately inflatable and deflatable wall portion means that once the bunding has been inflated it is only necessary to deflate one
15 wall portion to remove the equipment from the bunding. This feature is useful if the bunding is to be left erect for several days and the equipment is moved in and out of the bunded area during this time.

The bunding system preferably further comprises a floor portion.
20

Preferably the bunding system has walls of circular section as these offer firm support.

The bunding system is preferably rectangular but may be of any suitable
25 shape, for example circular. The bunding system may comprise two wall portions positioned to give the desired shape, alternatively the bunding system may comprise four wall portions with three of the wall portions having means to allow air to flow between them.

30 The bunding is preferably formed from a single sheet of material for ease of manufacture. Most preferably the walls are formed by folding the

sheet inwards to define the space to be inflated. This ensures that the seams are not exposed. Heat sealing is the preferred joining technique for generating the inflatable spaces.

- 5 In addition to the floor portion the bunding system is preferably provided with a floor panel to reinforce the floor portion. The floor panel may be secured to the wall or floor portions of the bunding system.

10 The bunding system may be provided with bracing or restraining means to aid in supporting the system and fixing its position. The bracing or restraining means preferable comprises rings secured to outer surfaces of the wall portions to which ropes can be attached. The system can therefore be used with minimum preparation even on a sloping site.

- 15 A protective under blanket may be secured to the under side of the floor portion of the bunding system to prevent the floor portion from becoming damaged during use. The under blanket may cover all or part of the under side of the floor portion, the under blanket may be larger in size than the floor portion and preferably extends outwardly therefrom.

20

A portion of the under blanket extending outwardly from the floor portion, or alternatively an extension of the floor panel, may be folded over the at least one separately inflatable and deflatable wall portion when it is deflated to protect the wall portion from damage when the equipment
25 is moved into or out of the bunded area.

The under blanket may be made from polywoven PVC and/or a geotex material (GEOTEX is a registered Trade Mark of Synthetic Industries, Inc).

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The wall and floor portions of the bunding system can be made from PES, polypropylene or another suitable plastics material. A PVC coating may be applied to the material forming the bunding system. A UV protective coating may be applied to the material forming the bunding system.

5

The floor panel of the bunding system is preferably made from a heavy duty rubberised material such as a material made from fibres coated in rubber, such material is used in the manufacture of conveyor belts.

- 10 The bunding system may be provided with an appropriate transport means. Preferable the transport means comprises a transportable base member including a reel, adapted to carry the bunding system, mounted on support means secured to the base and rotatable about its longitudinal axis, means for selectively rotating the reel in a clockwise or anti-
15 clockwise direction and means for permitting the base member to be moved in a direction normal to the longitudinal axis of the reel.

The base member preferably includes wheels to permit movement thereof.

- 20 The base member is preferably located on a trailer for towing behind a vehicle and the means to support the reel is preferably carried on a turntable mounted on the base member for rotation between a rest position, wherein the reel is parallel to the longitudinal axis of the trailer, and a working position, wherein the reel is transverse to the longitudinal
25 axis of the trailer, and includes means to rotate the turntable between the rest and the working positions.

- The base member preferably forms the deck of the trailer. Preferably means, such as a bolt, are provided to lock the turntable in one of its two
30 positions.

Means for selectively rotating the reel may provide for the reel to rotate freely in one direction and to be driven to rotate in the opposite direction, whereby the bunding system may be withdrawn from the reel by tension applied to the system and rewound onto the reel when the reel is driven to rotate in the opposite direction. The reel may be driven to rotate by a motor or an hydraulic means.

A roller bar may be situated behind the reel when it is the working position to prevent damage to the bunding system as it is laid-out or reeled in. The guide bar is preferably secured to the turntable, alternatively it may be secured to the means to support the reel. The height of the roller guide bar is preferably adjustable, most preferably by an hydraulic means. The roller guide bar also helps to expel air from the bunding system as it is reeled in.

15

The means to support the reel preferably comprises two support members, one positioned at either end of the reel to allow free rotation of the reel.

The bunding system maybe provided with winding straps extending therefrom that can be secured to the reel, alternatively the reel may be provided with winding straps that can be secured to the bunding system. The straps maybe attached to the reel or the bunding system permanently or releasably.

The bunding system may be provided with a cover. The cover may be provided with a plurality of hooks around its edge. The bunding system may be provided with a rope, preferably an elasticated rope, around at least part of the outer surface of the wall portions. The cover is preferably secured to the bunding system by attaching the hooks to the rope. The cover is preferably waterproof.

30

Further objects and advantages of the present invention will become clear from the following description of the invention which is not intended to be limiting and which refers to the figures in which: -

5 **Figure 1** shows a perspective view of the bunding system of the present invention;

Figure 2 shows a perspective view of the bunding system of Figure 1 with a portion of the bunding wall deflated;

10

Figure 3 shows a side view of the bunding system of Figures 1 and 2 with a cover in place;

15

Figure 4 shows a plan view of the bunding system of Figures 1-3 having winding straps attached thereto;

Figure 5 shows a side view of a trailer base including a reel to contain a bunding system;

20

Figure 6 shows a plan view of the trailer base with the reel in its working position and a bunding system laid on the ground behind it; and

25

Figure 7 shows a side view of the trailer base of Figure 6 with its reel in the working position reeling in the bunding system.

The bunding system 1 shown in Figure 1 comprises four wall portions 2a, 2b, 2c and 2d and a floor portion 3. The bunding system 1 is made by rolling the edges of a rectangular sheet forming the floor portion 3 inwards to form wall portions 2a, 2b, 2c and 2d of a circular section. The sheet forming the floor portion 3 is heat sealed to itself to form the

30

5 wall portions. The corners between the wall portion 2a, 2b, 2c and 2d are formed by heat welding the ends of the wall portions together, in the form of a crimp, and bringing the flat crimp portion of the wall portions to be secured to each other together and heat welding the crimp portions together firmly. The joint produced is strong and contributes to the structural integrity of the bunding system.

10 The corners between wall portions 2b, 2c and 2d are provided with airways extending between the wall portions to allow the three wall portions to be inflated together.

The bunding system 1 has wall portions 2a, 2b, 2c and 2d and floor portion 3 formed from PES having a material weight of 1200g/m².

15 A floor panel 4 made from a heavy rubberised material is placed on top of the floor portion 3 to add reinforcement to the floor portion 3. The floor panel 4 is longer than the floor portion 3 and one end 5 of the floor panel 4 is folded back on itself so that the floor panel 4 fits within the wall portions 2a, 2b, 2c and 2d.

20

The bunding system 1 is provided with an under blanket 6, made from polywoven PVC, secured to the underside of the floor portion 3 and extending out from under the wall 2a of the bunding system 1. Three of the sides of the underblanket 6 are stitched to strips of PVC about 15cm
25 width and the underblanket 6 is then welded to the floor portion 3 of the bunding system using the PVC strips.

The wall portions 2b and 2d are provided with a number of metal rings 50 on their uppermost surface. Straps 51 having hooks or clips 52 on each
30 end can be secured between a ring on wall portion 2b and a ring on wall portion 2d to prevent bowing of the walls.

The wall portions 2b, 2c and 2d are inflatable together through the inflation valve 7. An air pressure release valve 8 is provided in wall portion 2b to prevent over inflation. The wall portions 2b, 2c and 2d are
5 deflated using air release valves 9. The wall portions 2b and 2d are provided with two release valves and the wall portion 2c is provided with a single release valve.

The wall portion 2a is inflatable and deflatable separately from the other
10 wall portions. The wall portion 2a is provided with an inflation valve 10, a deflation valve 11 and an air pressure release valve 12.

Figure 2 shows the bunding system 1 of Figure 1 and like numbers cover like parts. The bunding system in Figure 2 has the wall portion 2a
15 deflated through deflation valve 11 and the end 5 of the floor panel 4 is folded over the deflated wall portion 2a to protect it when equipment is being moved in and out of the bunding system 1.

In use the bunding system is laid out on the ground in the required
20 position and the wall portions 2b, 2c and 2d are inflated through inflation valve 7 using an air compressor or an air pump. The floor panel 4 is then laid out inside the wall portions 2b, 2c and 2d on top of the floor portion 3 such that the end 5 lies over the deflated wall portion 2a.

25 The equipment, for example a road tanker, to be housed in the bunding system can then be moved into the bunded area within the wall portions. The end 5 of the floor panel 4 is folded back into the bunded area and the wall portion 2a is inflated by the introduction of compressed gas through inflation valve 10.

The wall portion 2a can be deflated through deflation valve 11 to allow the equipment to be removed from the bunded area. The wall portions 2b, 2c and 2d can be deflated through deflation valves 9 and the bunding system can be folded or rolled up for transportation to a new site.

5

The bunding system 1 can be provided with a cover as shown in Figure 3 where like numbers indicate like parts. The outer surface of the wall portions 2a, 2b, 2c and 2d are provided with loops 13 through which an elasticated rope 14 is passed. A cover 15, sized to fit over the bunding system is provided with hooks 16 on strings 7 to engage the rope 14. The straps 51 stretched between rings 50 prevent sagging of the cover 15.

10

The bunding system 1 can be provided with winding straps 18 for attachment to a trailer. The winding straps are shown in Figure 4 where again like numbers indicate like parts.

15

The bunding system can be used with a trailer 20 designed to lay out and reel in the bunding system 1 easily and quickly. The provision of a trailer also makes it easy to transport the bunding system 1. An appropriate trailer is shown in Figure 5.

20

The trailer 20 comprises wheels 21, base 22 and towing bar 23. A turntable 24 is mounted in the centre of the base 22 supporting a platform 25 on which is mounted a reel 26 by means of support members 27. The reel comprises two end pieces 28 pivotally secured to the support members 27 and three horizontal bars 29 running between the two end pieces 28. The rotation of the reel 26 is controlled by the winding motor 30 mounted on the platform 25.

25

The turntable 24 is locked in its rest position (parallel to the trailer) or working position (transverse to the trailer) by means of a locking bolt 31

30

passing through an aperture in an extension 32 of the platform 25 and also when in the rest position passing through an aperture in extension 33 on the base 22. When the turntable is in the working position the bolt 31 passes through the aperture in the extension 32 of the platform 25 and
5 also through an aperture in an extension 34 on the base 22.

In Figures 6 and 7, in which like numbers indicate like parts, the platform 25 and reel 26 are transverse to the trailer base 22 in the "working" position. The bunding system 1 is shown on the ground behind the trailer
10 20 secured to the reel 26 by winding straps 18. A roller guide bar 40 is secured to the platform 22 such that the bunding system passes over the bar when it is laid out or reeled in (see Figure 7 in particular).

To load the bunding system 1 onto the trailer 20 the bunding system 1 is
15 secured to the reel 26 by means of winding straps 18. The winding motor 30 is actuated to rotate the reel 26 in one direction (anti-clockwise) and reel in the bunding system 1 ready for transport to the site.

To lay out the bunding system 1 the turntable 24 is unlocked and rotated
20 until the reel 26 and platform 25 are transverse to the trailer base 22, in the working position. The turntable 24 is locked in the working position by the bolt 31 passing through the aperture in the extension 34 of the base 22. The reel 26 is allowed to freewheel (clockwise) by disconnecting the drive from the motor 30 and the free end of the bunding system 1 is
25 secured to the ground by pegs 35 and ropes 36. The trailer 20 is then towed slowly away from the secured end of the bunding system 1 by the vehicle 37 until the bunding system 1 is transferred to the ground. The winding straps can then be disconnected and the bunding system can be inflated.

When the bunding is no longer needed it is deflated by means of deflation valves 9 and 11. The trailer 20 is towed to the site and the turntable 24 rotated to its working position and locked in position in the manner described above. The winding straps 18 are secured in position between
5 the reel 26 and the bunding system 1. The winding motor 30 is actuated to rotate reel 26 and wind in the bunding system over roller guide bar 40, which protects the bunding system from damage and forces excess air out. Once the bunding system has been wound onto the reel 26 the winding motor 30 is stopped and the reel 26 is locked. The turntable 24 is
10 unlocked, rotated to the rest position and locked in that position for transportation.

CLAIMS

1. A bunding system suitable for the storage of fluid materials comprising an inflatable frame comprising two or more wall portions
5 wherein at least one of the two or more wall portions is inflatable and deflatable separately from the remaining wall portions and the bunding system is capable of being rolled or folded up.
2. A bunding system according to Claim 1 wherein the bunding
10 system comprises two wall portions positioned to give desired shape.
3. A bunding system according to Claim 2 which is circular.
4. A bunding according to Claim 1 wherein the bunding system
15 comprises four wall portions.
5. A bunding system according to Claim 4 wherein two or three of the wall portions have means to allow air to flow between them.
- 20 6. A bunding system according to any preceding claim wherein the wall portions are of circular section.
7. A bunding system according to any preceding claim wherein the bunding system further comprises a floor portion.
25
8. A bunding system according to Claim 7 wherein the floor portion of the bunding system is provided with a floor panel to reinforce the floor portion.
- 30 9. A bunding system according to Claim 8 wherein the floor panel is secured to the wall or floor portions of the bunding system.

10. A bunding system according to any preceding claim wherein the bunding system is provided with bracing or restraining means to aid in supporting the system and fixing its position.
- 5
11. A bunding system according to Claim 10 wherein the bracing or restraining means comprises rings secured to outer surfaces of the wall portions to which ropes can be attached.
- 10 12. A bunding system according to any one of Claims 7 to 11 wherein a protective under blanket is secured to the under side of the floor portion of the bunding system to prevent the floor portion from becoming damaged during use.
- 15 13. A bunding system according to Claim 12 wherein the under blanket is larger in size than the floor portion and extends outwardly therefrom.
14. A bunding system according to Claim 7 wherein the floor portion is larger in size than the bunding system and extends outwardly therefrom.
- 20
15. A method of forming a bunding system according to Claim 1 from a single sheet of material.
- 25 16. A method according to Claim 15 wherein the two or more wall portions are formed by folding the edge portions of the sheet of material inward to define two or more spaces to be inflated.
- 30 17. A method according to Claim 16 wherein heat sealing is used to secure the folded edge portions of material to the remainder of the material to form two or more inflatable wall portions.

18. A bunding system according to Claim 1 in combination with a transport means comprising a transportable base member including a reel, adapted to carry the bunding system, mounted on support means secured to the base and rotatable about its longitudinal axis, means for selectively rotating the reel in a clockwise or anti-clockwise direction and means for permitting the base member to be moved in a direction normal to the longitudinal axis of the reel.

10 19. A bunding system substantially as described herein and with reference to figures 1 to 4.

20. A method of forming a bunding system substantially as described herein.

15

21. A combination of a bunding system and an apparatus used to transport the bunding system substantially as described herein and with reference to figures 5 to 7.